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Climate change and globalisation as 'Double Exposure': Implications for policy development

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ABSTRACT

As a central reference point for policy makers, the Intergovernmental Panel for Climate Change (IPCC) recognises the value of place-based studies. Yet, tenets of generalisation and replicability dominate the organisation, and influence policy development globally. There is a growing concern that these are not conducive to building effective policy interventions that adequately accommodate local needs. This study uses a *living with* approach to explore how change and development was experienced by a small agricultural community in the Indian Himalayas. The findings reveal 'double exposure' to an increasingly deficient water supply, and aspects of globalisation. The community responded by changing its work practices along gender lines, and subsequently innovating farming output. Two underpinning mechanisms enabled the changes: The preservation of men's higher status; and the social devaluation of farming as a local profession. The value of this place-based study lies in the scope of details that capture how climate change and globalisation were manifested in this specific environment, and the characteristics of the response itself. Yet, most importantly, the nuances of the field jar with ideals of generalisation and replicability. As such, the study motivates a greater need for climate change organisations to reflect on how they might better achieve policy objectives.

1. Introduction

This paper joins the conversation on climate change and human adaptation. Specifically, we present findings from an ethnographic study in the Indian Himalayas on localised experiences of climate change. In our particular case, gender and pressures stemming from globalisation influenced how this experience unfurled. Our article highlights the value of place-based studies, where responses to such pressures are diverse (Adger et al., 2007). We illustrate the consequences of this diversity for how society 'knows' adaptation; how it develops an understanding on the many ways in which adaptation unfurls in practice.

In the more formal setting of the Intergovernmental Panel on Climate Change (IPCC), the practicalities of enfolding the different ways of 'knowing' adaptation into a coherent and consistent voice is problematic. Yet, the challenge must be met, not least because of the extensive impact of the IPCC on policy development (Hulme and Mahony, 2010; Beck et al., 2014). Although it is not the aim of this article to address this challenge directly, we do demonstrate the implications of place-based studies for the IPCC, and other organisations concerned with climate change overall. We highlight the potential contribution of place-based studies to 'knowing' adaptation, by emphasising the importance of local perspectives, experiences and responses. In doing so, we argue for their increased inclusion into the IPCC as an important and influential reference point for climate policymakers. Our work also highlights the implications of qualitative field work for the relationship between science and policy overall.

In theory, both the IPCC's role, and how it relates to policy, make an effective andtransparent contribution to understanding and addressing climate change issues. The organisation is positioned at the front end of a 'linear model of expertise', where science informs policy (Beck, 2011). The role of the IPCC therefore is to provide "…a clear scientific view on the current state of knowledge in climate change…" (IPCC, 2017), whilst overtly abstaining from developing policy itself: It seeks to be policy relevant, but not prescriptive (Hulme, 2017). Again in theory, this approach benefits the organisation in two related ways. First, by identifying only as a knowledge repository, it avoids the political tensions associated with policymaking (e.g. Eriksen et al., 2015). Second, this combined with the IPCC's scientific approach, allows data to be ostensibly 'value free and neutral' - as products of science, as 'truths' or 'facts' (Beck, 2011: 299). Consequently, the IPCC itself becomes synonymous with the assumed objectivity of its scientific role and relationship to policy, driving forward a credible, salient reputation (Guston, 2001).

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In practice, the IPCC's role and approach are more complex. Besides the long aired criticisms of its political influence in reality (e.g. Boehmer-Christiansen, 1994), other issues pivot on its scientific core. For many decades, disciplines such as earth science and hydrology dominated climate change literature, meaning that the IPCC's epistemological basis was defined very early on, i.e. as one of science. More recently, human dimensions of climate change have edged into the IPCC's scope, and social scientists have become more involved (Bjurström and Polk, 2011).

The continuing problem is that they still represent a very small minority, and are somewhat marginalised (Hulme, 2017; Malone and Rayner, 2001; Pelling, 2011; Shackley and Skodvin, 1995; Yearley, 2009). As a result, social sciences are at the bottom of knowledge hierarches, in which science dominates (Godal, 2003; Nielsen and Sejersen, 2012; Yearley, 2009). These hierarchies inform the framing of concepts such as vulnerability (Hulme, 2011; Mahony, 2014; Swyngedouw, 2010). McCarthy (2001: 982), for instance, notes the IPCC's use of 'human systems' - a term that glosses over the importance of individual experience (Orlove, 2009; Pelling, 2011). Knowledge hierarchies further inform the value given over to social science work in practice. Bottazzi (2014) notes, for example, how local contexts - and the data they generate - remain trivialised in climate change discourse and strategy.

Simply put, the IPCC is not exploiting the benefits that true epistemological pluralism could offer (Miller et al., 2008). Adaptation illustrates the point. Research has revealed pertinent phenomena that influence but also differentiate climate change experiences from location to location: Gender, poverty, age, globalisation, and so on (Adger et al., 2007; O'Brien and Leichenko, 2000). In our own case that we describe in this paper, gender relations and norms influenced how a community responded to climate change pressures. We also found that aspects of globalisation influenced how the process of community change unfurled. Yet, both gender and forces of globalisation were deeply embedded in the localised and individual cultural fabric of the specific village we explored. In reflecting on our own field work described in this paper, and to mirror the sentiments of Orlove (2005, 2009) and Pelling (2011), for example, we argue that social science is better positioned to capture the richness of social, cultural, and cognitive elements of localised dynamics, which invite a deeper understanding of adaptation. To an extent, the IPCC has acknowledged this. Ten years ago, it called for more 'place-based studies' (Adger et al., 2007: 729). More recently it described adaptation as 'place and context specific', and noted the value of 'bottom up studies' (IPCC, 2014: 25, 2014, 883). However, it also conceded that they have not been 'used consistently in existing adaptation efforts' (IPCC, 2014: 25; 2014: 883).

One explanation for this lies in the extent to which knowledge hierarchies have been institutionalised within the IPCC, i.e. whilst the organisation overtly commends social science approaches, in reality it pays little more than lip-service. Even the IPCC's working group that is responsible for human adaption, for example, describe 'modeling' (e.g. IPCC, 2014: 883; 884). It notes the value of 'scaling up' successful pilot projects (IPCC, 2014: 879). It reports adaptation strategies as a 'general plan' (IPCC, 2014: 873). It describes 'frameworks' as 'national' and 'consistent' (IPCC, 2014: 879), and as a way of objectively 'measuring' adaptation (IPCC, 2014: 880). And when 'community based adaptation' is described, it claims how 'scientific research methods' have 'strengthened the ability of communities to plan' (IPCC, 2014: 881).

These, and other examples within IPCC reporting, suggest a bias towards principles and values more closely aligned to the natural sciences - objectivity, generalisation, replication, and so on. Importantly, the marginalisation of at least some social science approaches and methods (e.g. ethnography, grounded theory) represents a significant barrier to understanding climate change issues, especially those concerning adaptation (e.g. Liverman, 2009; O'Brien et al., 2007; Pielke, 2005; Schipper, 2006). The concept was first observed in non-human environments where scientific approaches were appropriate: Understanding adaptation pivoted on its accurate measurement (Orlove, 2005, 2009; Pelling, 2011). Now we recognise adaptation as a powerful process in human contexts, but to extrapolate scientific approaches to their study is not conducive (Orlove, 2005). Rather, the complexity of the human experience demands alternative methods from the social sciences that focus less on measurement per se, and more on understanding the intricate dynamics between the social, cultural, cognitive, and so on, as above (Bottazzi (2014).

Our case study responds to our observations, and those of other researchers - some of whom themselves engage with the IPCC. Our case aims to capture the nuances of adaptation as situated in an analysis of one particular community. As social scientists, we see adaptation as we describe above, i.e. as a complex process that is embedded in the social, cultural, and cognitive, rather than as a single decision or measure (Pelling, 2011). Thus, we aim to understand the socio-environmental processes (Nightingale, 2015) of adaptation as they occurred in the field. In doing so, we also illustrate some of the shortcomings of scientific approaches in practice, especially those which cannot capture the dynamics of the context in which adaptation unfurls.

To this end, we chose a 'living with' perspective, which has synergy with some of the broad, overarching principles of social ontology. This frame of reference to 'being' generally describes the nature, characteristics, structures, dynamics, and so on, of 'social life', but which also recognises that its reality is constructed cognitively by people's values and notions (Searle, 1995, 2006). Our approach is consistent with two of social ontology's general principles in particular. First, we avoid paradigmatic divisions like social, economic, psychological, and so on. In reality, social life consists of phenomena that seamlessly transcend synthetic ways of organising. Thus, we want to capture how people 'live with' climate change in their 'lives' - defined as broadly as possible. Second, we try to capture how people 'live with' climate change, with definitions and meanings that are embedded in, and emerge from, the field itself.

Two relatively recent articles illustrate how a living with approach can be used in research. They also showcase its strengths, especially in comparison to more scientific methods. In their ethnographic work, Brugger and Crimmins (2013) described emotions, actions, and attitudes as social responses to climate change in rural Southwest America. These were deeply and richly embedded in, and driven by, localised meanings. They described underlying causes to community, group and individual vulnerability - something which the authors argued that more economic and technology focussed frameworks, such as those favoured by the IPCC, fail to capture. On this point, our own findings illustrate the same. Further, Brugger and Crimmins designed their study around a qualitative analysis of a community, i.e. their starting point was to explore all aspects of the field, rather than framing their study as an investigation into climate change responses from the outset. This allowed for pertinent dynamics and phenomena to freely emerge, unconstrained by researcher imposed disciplinary boundaries. The authors' bottom-up approach meant they were able to secure an understanding of the key issues, instead of merely measuring climate change impacts. These strengths are also seen in the work of Horton et al. (2015). They adopted a living with approach to reveal 'every day geographies' (903) of how children experience sustainable urban architecture in the UK. The advantages of bottom-up qualitative work that unveil nuanced experience was again evident, i.e. the rich localised narratives that scientific approaches simply cannot capture. In particular, Horton et al. (2015) demonstrate how a living with approach can accommodate unusual or unexpected data - expressed in the participants' own ways that differ with age, culture, and so on.

To summarise, we see the value that place-based studies generate for understanding adaptation. Specifically we argue that they illustrate the localised nature of climate change experiences and responses. Simultaneously we see the implications of this for the IPCC, and for how the relationship between science and climate policy is organised overall. Our case work illustrates these insights. In the next section, we

review the literature on gender and aspects of globalization, which as we have already briefly described, were crucial factors in the localised experience of climate change *in this particular* field. We then outline our field, methods, and process of data analysis. We then describe our findings, which we discuss in light of more scientific approaches. We conclude by discussing our contributions, and some final remarks.

2. Literature review

2.1. Women and climate change

In the specific community that we explored, we found gender dynamics to be especially influential in how climate change was both experienced and responded to. Hence in this section, we start with a review of some of the literature on gender.

Overall, research carried out in a wide range of contexts suggests that men and women experience climate change differently (e.g. Aoyagi et al., 2011; MacGregor, 2010; Neumayer and Plümper, 2007; Singh et al., 2010; Terry, 2009). In developing countries, for example, climate change disproportionately affects women's earning capacity and their position within families and wider communities (e.g. Dankelman, 2010; Dankelman and Jansen, 2010; Skinner, 2011). Other studies have highlighted women's vulnerability by their absence in important decision making processes within local communities (e.g. Arora-Jonsson, 2011; Fulu, 2007). Policy organisations concur. The IPCC (2007) for instance, emphasises women's vulnerability, differentiated on age, social class, and ethnicity (Adger et al., 2007; Carr and Thompson, 2013; Tschakert, 2014), whereas the World Health Organization (WHO) (2014) draws attention to climate change's effects on women's health.

Research has also shown an interest in gender issues and climate change within farming communities (e.g. Denton, 2002; Jost et al., 2016; Van Aelst and Holvoet, 2016). Jianjun et al. (2015) for instance, describe how men are significantly more likely than women to adopt new water conserving technology, or to invest in new irrigation technologies, despite men and women perceiving climate change effects the same (see also, Bayard et al., 2007; Dolisca et al., 2006). They explain this by drawing on literature that describes women as more risk averse (Jianjun et al., 2015). Conversely, Alston and Whittenbury (2013) describe how Australian women sought alternative employment to contribute to their family's 'farm survival strategy' (115), in response to water issues and economic hardship. Yet simultaneously to their role of support, they took ownership of their new work to resist traditional gender relations, and to create new positive identities for themselves.

Exploring gender as an isolated variable presents challenges in itself as it is inextricably entwined with other socio-economic and cultural phenomena. To an extent, policy organisations acknowledge this, as above. However, how and the extent to which gender is entwined with other phenomena differs across regions and small scale communities. In other words, the localisation of climate change experience is embedded in widely differentiated environments with varied features and dynamics. Whilst some of these features are easier to define - for example, age and ethnicity - others are less tangible in how they present - and the extent to which they interact. Yadav and Lal (2018), for example, in their review draw the conclusion of women's overall vulnerability when compared to men. Yet, they also noted the nuanced influence of - and interaction with - education and workload, domestic rituals, health and poverty, and so on.

One phenomenon that seems especially impactful on rural communities is globalisation. In light of other social stressors that we uncovered in our fieldwork, we now review some of the literature in relation to climate change.

2.2. Climate change and globalisation

'Double exposure' refers to when climate change exists alongside other pressures, usually stemming from globalisation (Leichenko et al., 2010; O'Brien et al., 2004; O'Brien and Leichenko, 2000). Different social groups, communities, ecosystems, etc, become either 'winners' or 'losers', according to their adaptive capacity (O'Brien and Leichenko, 2000, 2003; Leichenko and O'Brien, 2008). One pressure may 'offset' the other, or even create opportunities. Maladaptation (Barnett and O'Neill, 2010) can occur when multiple pressures increase vulnerability (McDowell and Hess, 2012), to produce 'double losers' (O'Brien and Leichenko, 2000; Leichenko and O'Brien, 2008).

O'Brien and Leichenko (2000, 2003) typified globalisation by free trade and market liberalisation. But even within a broader meaning, double exposure has become an increasingly popular way to approach climate change issues (e.g. Bradshaw, 2014; Brunner and Grêt-Regamey, 2016; Bu et al., 2016; Burton and Peoples, 2014; Lennox, 2015; Lennox and Gowdy, 2014). In addition, the IPCC acknowledges 'multiple stressors' as important and realistic (IPCC, 2007: 729). In other words, other pressures exist (heterogeneously) alongside climate change stressors. These could include poverty, issues of sanitation and food security, conflict, and so on, but also those pivoting on globalisation.

Explorations into water issues in agriculture and aspects of globalisation are particularly relevant here. Mozambique in the late 1990s, for example, experienced market liberalisation, but also flooding that severely affected crop yields. Both influenced farmers abandoning their farms (Leichenko and O'brien, 2002). Mozambique saw similar effects of climate change and economic issues in subsequent years, but in the context of drought. For a time, the government financially supported poorer farmers before the cash economy pressured farmers again to abandon their smallholdings (Eriksen and Silva, 2009; Silva et al., 2010). Other countries have their own examples of farming being adversely doubly exposed: Ghana (Laube et al., 2012); India (O'Brien et al., 2004); Mexico (Keleman, 2010); Morocco (Schilling et al., 2012); Mesoamerica (Castellanos et al., 2013); New Zealand (Burton and Peoples, 2014), Vietnam (Fortier and Trang, 2013), for instance.

Little is known about how, or even if, double exposure is unfurling in high altitude communities. As one conduit of globalisation, tourism seems to be on the rise (e.g. Richins et al., 2016; Singh & Kumar, 2015). Valdivia and Barbieri (2014) describe how Andean Altiplano farming households are involved in agri-tourism to supplement their income, for example, and the Indian Himachal Pradesh State Tourism Policy (2005) aims to make the Northwestern Himalaya a 'leading global destination by 2020' (Singh & Kumar, 2015: 25). At the same time, climate change is acutely affecting the physical features of mountainous regions. Global warming is accelerating glacial retreat (WGMS, 2008), decreasing the available 'runoff' water which communities need to survive (e.g. Bradley et al., 2006; Laghari et al., 2012; Vanham et al., 2008).

Yet with very few exceptions, little is known of how these communities are adapting, in relation to socio-economic changes. Lennox's double exposure work in the Peruvian Andes is an example (Lennox, 2015). She identified changing agricultural profiles where farmers have moved away from traditional crops and towards animal husbandry. Where crop cultivation did continue, farmers embraced alternative crops, and adopted different planting techniques. Crucially, economic factors were juxtaposed with climate change pressures, with both stimulating patterns of change.

Before we present details as to how gender and other pressures influenced how the community in our field experienced and responded to climate change, we describe the field context itself. We then detail our methodology and process of data analysis.

3. Field context and methodology

3.1. Field

Dharsa is a Himalayan village in Ladakh, India, with a population of 59. At an altitude of 3600 m, it has a dry desert climate with short summers and harsh winters. The village is inaccessible for

approximately nine months of the year. In summer, travel between the village and Leh - the region's capital (population: c., 29 000) - is possible by rudimentary road.

The village relies on glacier fed streams for its water supply.[1] Runoff sustains all fourteen households, with subsistence agriculture being the mainstay for at least six centuries. Flatbed irrigation is used co-operatively, where cloth plugs are used. The farms take turns to direct the water flow from one of the main streams into smaller fissures. Water is then gently 'swept' between man-made furrows in which the crops are arranged. When irrigation is complete, the plugs are removed to replenish the main stream, ready for the next farm to repeat the process. Historically, each farm took between 45 and 90 min to adequately irrigate their land, depending on the plot size. Vegetables are harvested for vital food reserves in the winter, with a surplus traditionally sold to the Indian army. This revenue is always used to buy essential rice supplies for the winter months. Runoff also sustains animal husbandry: Sheep are kept for their fleece and cows are used for milk production. Villagers also produce dried cheese for the winter using traditional manual techniques.

There is an urgency to farming activity during the summer months: Long hours are worked to prepare for the upcoming winter. Villagers arise at 5am, and retire at midnight after eating. Work patterns and domestic activity are strongly embedded into the cultural fabric of the community. Harvests, for instance, are extremely time sensitive, and are carried out with every participant implicitly familiar with their role, as they are with all aspects of everyday life.

In this patriarchal community, gender roles are also specific. A historical division of labour means that men traditionally have had the responsibility for running the farms, and for making decisions - both key, and relatively minor - concerning the upkeep and organisation. Women have domestic responsibility, but also weed crops, milk cattle, and make blankets, for example. All the cooking is done by the women, which is then served to the men.

Inevitably, Dharsa, like the millions of mountainous villages spread over the globe has its distinguishing cultural factors. Indeed, the village's particular way(s) of dealing with and initiating change, illustrate the value of place-based studies, i.e. that community driven responses are bounded by their social and cultural context. At the same time, the pressure that climate change - and globalisation - inflicts, is far from an anomaly for mountain based communities. In this way, and in the broadest sense, this pressure for change mirrors that experienced by other communities, especially those in the Himalayan region.

3.2. Data and methods

The field work was conducted by the first author using an inductive, grounded theory approach (Glaser and Strauss, 1967). She had rudimentary language training prior to entering the field, but an interpreter was also used at the latter stages of data collection, especially for triangulation. Data were gathered over six consecutive weeks.

Data collection methods are stated in Table 1, with an indication of the activities that each method entailed, and the type and number of participants who engaged in each method. 'Aggregate Theoretical Dimensions' (ADTs) refer to the final themes to emerge from our raw data - the flow of which is illustrated in Fig. 1. The dimensions relate to the research questions that emerged from our data, which pivot on: (a) Establishing the problem (ATD 1); (b) Addressing the problem (ATD 2); (c) Enabling the response (ADT 3).

The aim of Table 1[2] is to depict data collection in more detail. In the field, the first author indiscriminately gathered data using whatever method was appropriate, i.e. the field itself dictated the choice of method used at any one time. This allowed for themes to emerge from the field itself, as per the tenets of inductive approaches generally.

We considered 'all data is data', as per the approach of Glaser (2001: 145) in grounded theory, meaning that we saw all data as making a contribution - either directly or indirectly - to the generated aggregate theoretical dimensions. This is illustrated by the data derived from participant observation activities. Ostensibly, the purpose of some activities undertaken by the first author was to keep her in situ - meal preparation, for example, and cleaning. However, at least in the early stages of field work these activities (perhaps with the exception of sleeping) also enabled a deep and clear understanding of the socio-cultural context - social structures and normative arrangements, for example - in which the experience of climate change unfurled. Thus, we see all the activities undertaken by the first author as contributory towards the generated aggregate theoretical dimensions and to a wider understanding of the context, which themselves were inextricably entwined.

All farms in the village took part. The first author lived and worked at one of these, ostensibly as any other adult female. After a few days of being in the field the novelty of the first author dwindled significantly, and she ate, slept, cooked, worked, and so on, alongside the villagers as a member of the community. The first author was inevitably more assimilated into the everyday activities of the farm in which she resided. However, she triangulated data from 'our' farm with other farms, and this addressed a potential skew. The geographical dispersion of the farms, along with social norms of reciprocation, made access easy: Social visits were frequent, where villagers wandered into each others' homes to weed, gossip, and cook, several times a day.

Specifically, 20 men and 25 women from Dharsa - almost the whole adult population present at the time of data collection - took part: Four men did not take part, as they were working away in the army. Two members of a non-governmental organisation (NGO) took part. They were selected on the basis of the length of time they had spent in the field (one for ten, the other for fifteen years), and on their availability. A state tourism officer was interviewed, as was the owner of a tourist lodge. Seven trekking tourists were interviewed in Leh - the only tourists that were available at the time. Further, eight visiting relatives to the village were also interviewed - again the only visitors to the village during the whole period of fieldwork.

3.3. Analysis

Data are reported using a first person narrative, and the applied analytic procedures did not deviate from well-established techniques of naturalistic inquiry and grounded theory (Glaser and Strauss, 1967; Locke, 2001). The initial narrative of village life developed as a working document when data became triangulated, sophisticated, and more deeply embedded in the field. The field context, as described above, draws on this document.

The first author continually scoped data from when she first entered the field, using methods and activities as stated in Table 1. Fig. 1 illustrates how the final research questions emerged from the data collected, and as a result of our analytical process.

Data were first coded and sorted into first order categories. 'Hydrological Changes', for example, was a first order category that consisted of data stemming from observations and interviews describing the flow of runoff and the moisture capacity in the soil. First

[1] As is usual in mountain regions, glacier mass is accumulated from solid precipitation in the winter, which then ablates during the warmer summer months in an accumulation-ablation cycle (Paul et al., 2007).

[2] The number of data collected is best illustrated as an expression of time. Several hundred unstructured 'interviews' were undertaken, for example, but (*footnote continued*) these included informal and impromptu dialogue of just a few exchanged sentences, as well as longer more in-depth interviews. The field diary was around 350 pages, but included the written equivalent of white noise - doodles, irregular blank spaces, etc.

Table 1
Methods, Activities, Participation and Contribution to Research Questions.

Method	Activities Entailed	Participants	Contribution
Unstructured 'Interviews'	Conversations ranging from a minute to around 90 minutes. Mainly unscheduled, informal and frequently when sharing an activity such as weeding.	All 25 female villagers. 18 male villages. 8 visiting relatives to Dharsa.	Initial data collection - all three Aggregate Theoretical Dimensions (ATDs). Triangulation - all three ATDs.
Semi-structured Interviews	Mainly scheduled, but some ad hoc. Lasting from between 30 to 90 minutes.	2 NGO members 7 trekking tourists in Leh. 1 State Tourism Officer 18 female villagers 15 male villages	Initial data collection and triangulation - ATD 1: Establishing the Problem. Initial data collection and triangulation - ATD 2: Addressing the Problem Triangulation - ADTs 2&3: Addressing the Problem; Enabling the Problem.
Observations	Day to day 'mundane' life - daily routines, conflicts between villagers, etc.	All 25 female villagers All 20 male villagers 8 visiting relatives to Dharsa.	Initial data collection - all three ADTs. Triangulation - all three ATDs
Participant Observation	Day to day 'mundane' life - cooking, cleaning, weeding and cultivating crops, milking cows, herding dos, making cheese, drying cow dung, fetching water, washing clothes, playing with and feeding children, brushing hair, repairing outbuildings, repairing shoes, etc. From approximately 4.45am until 12.30am. Further P.O. of one festival and one local 'baby shower'.	All 25 female villagers 16 male villagers 8 visiting relatives to Dharsa.	Indirectly - Initial data collection and triangulation - all three ATDs.
Field Diary	Writing and reflecting on all observations and participant observations. Reflecting on interviews. Recording of field researcher's thoughts, emotions, tentative questions as part of sense making.	First author.	Initial data collection - all three (ATDs). Triangulation - all three ATDs

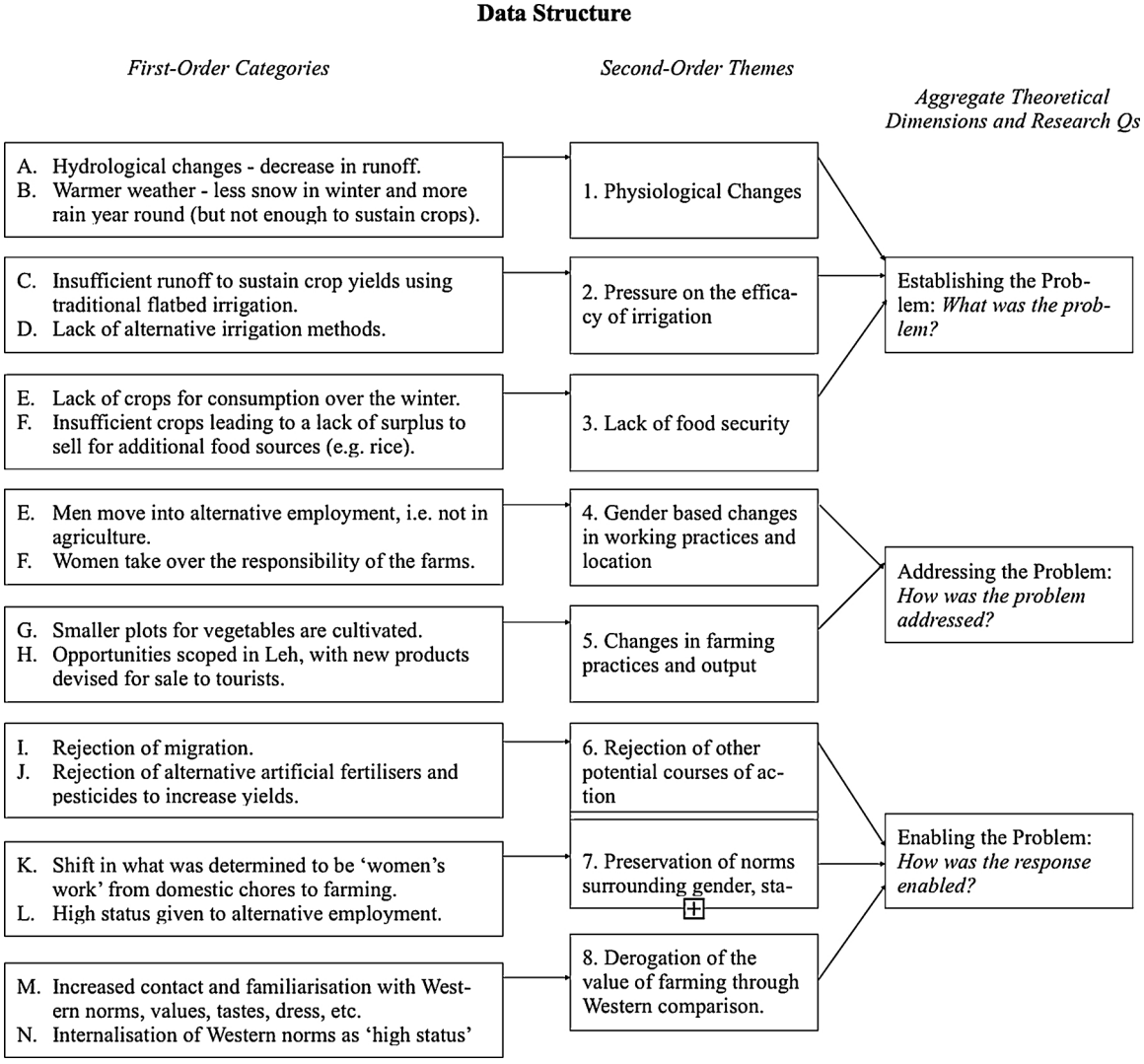
Data Structure
First-Order Categories
Second-Order Themes
Aggregate Theoretical Dimensions and Research Qs
A. Hydrological changes - decrease in runoff.
B. Warmer weather - less snow in winter and more rain year round (but not enough to sustain crops).
C. Insufficient runoff to sustain crop yields using traditional flatbed irrigation.
D. Lack of alternative irrigation methods.
E. Lack of crops for consumption over the winter.
F. Insufficient crops leading to a lack of surplus to sell for additional food sources (e.g. rice).
E. Men move into alternative employment, i.e. not in agriculture.
F. Women take over the responsibility of the farms.
G. Smaller plots for vegetables are cultivated.
H. Opportunities scoped in Leh, with new products devised for sale to tourists.
I. Rejection of migration.
J. Rejection of alternative artificial fertilisers and pesticides to increase yields.
K. Shift in what was determined to be 'women's work' from domestic chores to farming.
L. High status given to alternative employment.
M. Increased contact and familiarisation with Western norms, values, tastes, dress, etc.
N. Internalisation of Western norms as 'high status'
1. Physiological Changes
2. Pressure on the efficacy of irrigation
3. Lack of food security
4. Gender based changes in working practices and location
5. Changes in farming practices and output
6. Rejection of other potential courses of action
7. Preservation of norms surrounding gender, sta-
8. Derogation of the value of farming through Western comparison.
Establishing the Problem: What was the problem?
Addressing the Problem: How was the problem addressed?
Enabling the Problem: How was the response enabled?

Fig. 1. Data Structure.

order categories were then collapsed into second order themes. We sought association but also refutation, with a recursive and iterative process that consisted of 'trying out' the 'fit' of different first order categories into different themes.

These summative second order themes were organised into aggregate theoretical dimensions. Again, we sought refutation as well as association, using the same process of 'trying out' different second order themes in relation to different theoretical dimensions.

We constructed hypotheses as to the relationship between the three aggregate dimensions. In this process, we examined evidence from the dataset to support each hypothesis but we also sought evidence that could refute our hypotheses. Each aggregate theoretical dimension was rearranged into a research question, as above.

We now describe our findings, which we structure around the three aggregate theoretical dimensions, and related research questions. All findings described stem from the data collected, triangulated, and analysed.

4. Findings[3]

4.1. Establishing the problem

A decline in runoff began three summers earlier, during which time the volume of water became progressively smaller. Streams and fissures from which Dharsa drew its water supply, flowed more slowly. The first author observed two occasions where one of the main streams ran dry for several hours, which interviews revealed to be an anomaly. The decline in runoff did not negatively affect hydration, household cleaning, etc, or animal husbandry. However, it did affect the utility of traditional irrigation techniques.

The time taken by each farm to irrigate had doubled over the previous three years. Interviews with the villagers established this. Observations showed that insufficient flow slowed the process. Additionally, one senior NGO member, who had been visiting the area for eight years stated '… *there is no doubt that the water flow is much much slower now. Even five years ago, water was plentiful*…'. This established the hydrological changes in the area as persistent and significant.

Interviews established that deficient runoff progressively reduced crop yield, to the point of threatening the villagers' survival. They were aware of their increasing vulnerability. The reflection of community member Stanzin on the crop yield three summers before data collection was typical: '… *the first year [of deficient water flow] was very bad…We wonder if we survive* [the winter]… *there was no food at the end…And we knew that it* [can] *only be much worse* [in future years]…'.

In the following year, six of the biggest farms sought a smaller but better quality yield by proactively reducing the volume of crops sown. The other eight farms continued trying to irrigate all their existing land. This was an informed decision: '… *we think maybe it* [the experience of irrigation] *be different…be normal…maybe worse* [than the previous year]… *we don't know…but we try*…', explained Dolma A. The end output of both strategies was the same: All farms produced insufficient vegetables for the winter.

> '…[The women] *eat less*…' was a common response in describing how they addressed the now established problem of insufficient food and nutrition during the winter. Across all farms, men and children ate first, and women would sometimes skip meals, especially towards the end of the winter. Angmo explains: '…*The food runs out* [towards the end of winter]… *No rice and small vegetables…it is more important [that] the men and children eat. We* [women] *eat fewer and fewer… I used to being hungry…it is necessary…It pains* [indicates stomach area] *but it is more important to feed everyone* [the men and children] *first*…'

Dried cheese production was unaffected as a source of winter nourishment. But rice consumption was indirectly affected. There was no surplus of vegetables to sell to the army for rice in the two years prior to data collection. In the year before that, four farms produced a small, '… *not as big as normal*…' surplus, distributed to less fortunate farms to help them survive the winter. Two other farms sold some of their vegetables, despite a small deficiency in their harvest.

In summary, data from interviews and observations establish the following problem for Dharsa: First, runoff deficiency started at least three summers before data collection, becoming more acute year on year. Second, runoff deficiency adversely affected the utility of traditional irrigation practices. Third, the inability to adequately irrigate crops produced insufficient food, especially for winter reserves. Consequentially, the sustainability of Dharsa - having historically relied exclusively on the natural environment for its survival - was threatened.

In framing the problem as a two part issue, i.e. establishing a persistent and consistent decline in run-off, and its 'practical' impacts on the community, generates a first opportunity to reflect on our method of exploration, as it compares to more scientific approaches. Measuring water flow is clearly within the domain of standard methods used by hydrological and earth science. Arguably their data measuring activity would be more detailed, and would encourage more sophisticated techniques of comparison of water flow over time, for example, or to that in other areas. This part of the problem in many ways could be generalised, using 'modelling' (IPPC, 2014: 883) to 'scale up' (IPCC, 2014: 879) patterns of change to predict future flow. Even when we start to explore the tangible impacts of hydrological changes - such as crop yield, irrigation practices - scientific methods still seem to be appropriate. Despite their social embedment, these impacts are still tangible, objective and measurable. Thus, at least in terms of establishing the problem in our field, scientific methods would have sufficed - perhaps more so than our own approach.

However, establishing the problem is arguably underpinned by the notion of measurement - regardless of the epistemological approach adopted. We propose that scientific methods would struggle with the later parts of our exploration, where, having established the problem, we seek to understand the adaptation process, and the meaning of the tangible changes for the villagers.

4.2. Addressing the Problem

At the time of data collection, the type of crops had not changed, but were cultivated in smaller quantities, and on smaller plots of land. The most radical change concerned the scope of farming activity. There were clear changes to gender based work arrangements, and, despite the traditional stability in agricultural output, farms began to exploit socio-economic changes underway in Leh by innovating their produce.

The strongly patriarchy system that permeated multiple spheres of everyday life, extended to work practices. Ringchen's comments were typical: '… *no no no*…[before] *it was always my husband, my brother…the men*…[making] *the important farming choices. The women cooking, cleaning…weeding…That is it…Women's work*…' And Abi-chomo: '… [before] *it was never* [the women] *deciding anything…this is the man's job*…'

Yet, in the summer before data collection, the management of twelve farms passed from the men to the women of each household. One year later, all the farms were under female control, with women making all decisions, both strategically and on a day to day basis, with full financial control. They were also directly responsible for new farming produce - an innovation that interviews and observations suggest was a critical factor in the village's sustainable solution to the problem of deficient runoff.

Faced with the responsibility for failing farms, the women redefined the scope of Dharsa's traditional farming activity. In the year prior to

[3] Each quote presented is representative of a much larger body of discourse that describes the same sentiment in the specific context described, but which are not included for reasons of space.

data collection, the women initially saw potential opportunities with the nearby wild fruit trees. But, as the women explained: '… *we think we can pick to sell…Some of us go* [to Leh]… *It was a disaster* [laughing]… *Many fruit there and better* [quality]…' (Amal).

Despite this initial failure, some of the younger women persisted in spending time in Leh. They became sensitive to the changing fabric of Leh's everyday life, especially its visiting population, and economic landscape. '*We watch to understand changing things* [in Leh]…', explained Ringchen. Crucially, and encouraged by their increasingly sophisticated knowledge of Leh's socio- economic environment, the women developed what they frequently described as '*new farming things*'.

Historically, the women generally did not travel to Leh at all. But they all made at least three trips in the previous summer. They shared their knowledge informally, and the data showed that wanting to '… *make new farming*' activity was also a shared and inclusive experience. Understanding the '*new walking visitors*' (trekkers) to Leh and its surrounding area was pivotal.

In Leh the women also recognised two other important characteristics of the predominantly Western and Indian visitors to the region. First, their relative ability and willingness to spend money, and second, their appreciation for locally made organic products. Reflecting on how the women developed their understanding, Dolma B explains:

> We see much buying…very much…We watch a lot, walk after these people…in much time…Try to understand what they like…They are friendly and smile…We want to talk to them…'Welcome! Where are you going?', 'Why are you here?' …But…they no understand…Then we start talking with shop people…and we see…spend much time seeing…They [tourists] come with the clothes and the shoes, but I think [the visitors] like Ladakh things [locally made products] as well…the soap to clean…We see the walking people they not like things with the chemical…They like to have the water too…

This last comment refers to the availability of fresh, but comparatively expensive, '*mountain* [drinking] *water*' offered by one shop, and frequented by hikers, rather than locals. '… *We know they want because it is local…natural…better for health…we talk to the shop owner…*', explained Ringzen, for instance, again indicating the women's understanding of the market for natural, organic products. Both Dolma's and Ringzen's comments further indicate how the women persisted in their understanding.

The interviews with visiting trekkers confirmed a preference for organic, locally made produce over imported goods - specialist hiking apparel and equipment excepted. They placed high value on 'local' and 'environmentally good'. In summary, our field data supported the women's conclusions on the changing socio-economics of Leh, and its visiting population.

Back in Dharsa, the women then started to experiment with the kernels of the apricots they had harvested, and had been unsuccessful in selling. After a process of trial and error, and multiple failures, two products came to fruition: An apricot oil 'designed' as a dry skin moisturiser; and a skin exfoliator made with apricot kernels[4].

[4] The former had been made previously in the village, and had first started '… many years before…', albeit in a more simple format. About half the women in the village were already skilled in the basic technique. Observation data showed it to be a very labour intensive activity, physically demanding, and under prolonged periods of time in intense heat: It was made infrequently - once every few years. Interview data indicated that the women historically saw the oil as a means to clean their skin. However, the women became more sophisticated in their knowledge of 'Western skincare' by their visits to Leh, their own observations, and interactions with appropriate shop owners - the latter playing a pivotal role in the women learning about consumer demands. As a result, the women filtered the oil, for example, through cloth, to use purely as a skin moisturiser, whilst ground kernels were kept in, and sometimes added to, the oil to make a skin exfoliator, as two separate products.

At the time of data collection, women from all the village farms were involved in the production and sale of this '*new farming*' activity. Both products were bought by two of the shops in Leh that catered for trekking tourists, and demand was greater than what the women could supply. Crucially for the village's revenue, as the end of the summer approached, all the farms had raised enough money from their sales in Leh to buy enough rice for the next two winters.

This innovation reflected a major shift in traditional work practices, and, at face value, seemed to defy strongly patriarchal norms. But field data revealed a simultaneous change in work arrangements: The men of the village, having dispensed their farming responsibilities, embraced alternative forms of employment, sometimes working away from Dharsa for days or weeks elsewhere in the region. All men of employable age were employed. One man, having run his farm for over thirty years, became a postman in Leh. Others gained employment with the Indian army, as painters and carpenters at monasteries, as a tourist guide with a trekking company in Leh, and as masonry workers. Data suggested that their motivation was underpinned by increasingly derogatory views of farming that had begun to infiltrate village life - government issued school textbooks for example, regularly and clearly described farmers as 'slow' and 'backward', and visiting relatives having long '… *escaped the poverty of a farming life…*' (Gaph-chow), were clear in their disdain for agriculture, and its increasingly low status.

This shift left the women to their own devices. Men - eager to distance themselves from farming - would return from their paid jobs, disinterested, or amused, in the (now) '*women's work*' of farming: '*I think the women have nice life now playing with the apricot* [smiling]…' and '*I am not really interested in that* [farming] *anymore…*', were frequent remarks.

The sustainability of skincare as agricultural innovation - and the security of alternative forms of employment - could depend on numerous socio-economic forces in the coming years, independent of climatic change. However, the data indicate that these quite radical shifts in traditional work patterns enabled an optimum '*solution*' - as defined locally - at least in the short-term. Long-term presents more of a problem. Shifts in work arrangements, and responses to socio-economic opportunities reflect how the solution unfurled in practice. Yet in other ways, female initiated success was incongruent with the patriarchy embedded in the village, as the norm.

To an extent, *measuring* the responses of the community could have been achieved with scientific approaches - tracking role changes, for example, quantitatively. Yet as before, we mirror the sentiments of other researchers such as Orlove (2005, 2009) and Pelling (2011) to argue that understanding the intricacies and detail of adaptive change can only be achieved with place-based work. The persistence indicated by Dolma's words, for example, would be difficult for scientific approaches to capture. The availability of alternative work, the existence of a comparatively large touristic town within travelling distance, and apricot trees, for example, were simple yet crucial 'practical' enabling factors. Importantly, they point to the specificity of adaptive processes. Other villages experiencing pressures, may be devoid of the infrastructure needed for adaptation, for example, or at least have different tangible factors that create a different set of adaptive choices. This highlights how a '*general plan*' (IPCC, 2014: 873) of adaptation, where '*national*' and '*consistent frameworks*' (IPCC, 2014: 879) can be replicated and generalised across large scale regions indiscriminately, falls short of tackling the problem of localised climate change pressures.

We now present emergent constructs from the data to consider how the solution in Dharsa was 'allowed' to come to fruition. Before this, we consider alternative courses of action that the village could have taken, from an external perspective.

4.3. Enabling Dharsa's response

4.3.1. Potential alternative courses of action

Villagers perceived the problem of deficient runoff to worsen over

the coming years; the previous three to four years were not a temporary state. Their views were based on a historical reliance on the natural environment for survival that gave credence to their sensitivity towards localised changes in climate and precipitation, and an accurate understanding of implications. Dharsa's intrinsic relationship to its natural surroundings extended to a cultural context. The mountains were '… *home*…', a '… *protector*…', '… *special*…', and '… *everything*…', as many of the villagers described. They rejected the idea of resettling elsewhere, frequently expressing bewilderment. Data showed that two men and one woman who had left the village in their late teens and early twenties for cities were an anomaly, and even the younger villagers wanted to stay. Dawa explained,

> … the mountains…these mountains…are our home…They are the home of fathers and older fathers and older older fathers…We die here…Yes…maybe more soon if mountains decide…But…no… move to a big city… Leh…or other India…or north…no…what would we do?…That is not our place…this is our home…is hard and maybe make us dead…but it is home…

Another potential solution was to use chemical fertilisers to enhance crop yield. Two years previously, one farm (unenthusiastically) tried artificial fertiliser (crystalline urea and diammonium phosphate). Tsering describes, '… *a man from Leh come one day two summers before… he sell us bag…we use little…I don't know…I think no difference…But I think bad for soil…bad for vegetables…I don't like*'. All farmers indicated either an opposition or disinterest, frequently stating the use of traditional 'night soil' (matured human waste from compost toilets) - as '… *better*…', and stating a preference for bitter almond paste as a natural pesticide. At the time of data collection, the containers of the purchased chemical fertiliser were still two-thirds full of the original product.

These alternative solutions are important to state, as they contribute to an illustration of how acceptability is culturally weighted. To some external bodies - such as the IPCC - both the solutions of relocation and chemical fertilisers are ostensibly acceptable. However, our case work highlights their lack sensitivity to the nuanced practices and values intrinsically woven into the cultural fabric of small localised communities. These determined the boundaries of acceptability for potential solutions, *as defined by the field*. Two constructs were particularly strong in explaining the acceptability of the agricultural innovation that emerged.

4.3.2. Norms of gender behaviour

Patriarchal and localised norms demanded that men and women behave differently. Men's status was significantly higher than that of the women. In day to day living conditions, men frequently described '… *women not* [being] *as important as men*…'. The distribution of scarce food reserves in winter suggested that women accepted their lower status. In addition, boys were sent to school more frequently than girls, it being '… *more important for the boys* [than the girls] *to learn*…'

Work roles were strongly gendered. One diary entry makes the point:

> I was making mud bricks today, and two of the older women were laughing at my rather pathetic attempts. I smiled, but then Dolma B scolded them, and explained to me that after the men went away into other paid employment, all the women had to learn how to do this. Now the men don't touch the bricks, even though they are present sometimes. The women make them all, and they [the women] mend the outbuildings too where the walls have decayed - basically all the jobs on the farms that had been done by the men before…Dolma B explained to me that this was part of farming…the responsibility of the women.

Both men and women described '… *the work of men* [being] *more important* [than] *the work women do*…'. This was despite how the women's agricultural innovation was making a comparatively significant contribution to the village's sustainability. An excerpt from a lengthy and candid interview with Gaph-chow - a young woman originally from Dharsa who was now teaching English and Chemistry in north India - illustrates the female villagers' lower status, despite their contribution:

> …women are not seen as good as men here [in Dharsa and the region in general]…When I was growing up I begged my parents to send me to school. I would steal my brother's books, even though I couldn't read…I pretended [laughing]. It is always the boys who are the princes…seen as more worthy…And now, you can see my mother…you see the women here…with the new [innovations] they are doing…it's great. We have brains! But still the men…my own father too…laugh and think that the women are playing, that the work [that women are doing] is easy and not important…Of course it is important! The work of these strong women has saved [the village] from starvation! So how is this not important?…

In summary, a division of labour was consciously maintained, even when the farms were transferred to the women, and the men began to take alternative paid employment: 'Mens' work' became 'women's work, but was still clearly separated and distributed. However, the new work arrangements also meant that women were starting to hint at aspects of a higher status with their new economic success, independence, decision making, and financial control, something clearly in breach of patriarchal norms.

One potential explanation for this tension is that whilst a division of labour was maintained, the gap in status between men and women eroded: The latter being 'allowed' to occupy high status work, because the women's status was equal to that of the men. Yet the data did not support this. Gender inequality was a strong and unyielding social arrangement that was overtly maintained by both men and women. An alternative explanation emerged from the data.

4.3.3. Changing norms on local perceptions of farming

Gender inequality was a rigid norm, but values towards farming changed and became lower status. This shift maintained women's low status, whilst accommodating their move into their new work roles. A growing disregard for the value of faming also created a sense of freedom where the women were 'allowed' to innovate farming output, because of the poor value now attached to anything agricultural. As Amal comments, '… *now the men go to work* [outside the farms]… *we are left* [alone]… *we do what we want…They are not interested…But this is good…we can do new things*…'

Strong evidence suggested that deficient runoff drove women to innovate. Yet, socio-economic opportunities helped. Some of the non-farming roles that men occupied were newly created - those in tourism, for example - albeit most were not. Still, their availability allowed men to move into these roles, preserving their high status by reassigning farming (as low status work) to women. '… *Farm work is for donkey… now we* [the men] *get new jobs…jobs with money…It is nice for women to do farm…to play…but it is not important…It is for people who go in backward direction…Other work more important* [than farming]…' said Stanzin, whose wife ran their farm whilst he was employed as a builder for the nearby monastery. Other men described alternative work as '… *superior*…', '… *better*…', having '… *more meaning*…', and being '… *more important*…'. The terms '… *responsible*…', '… *helpful*…' and '…*essential*…' were commonly attributed. Conversely, men consistently described farming as '… *stupid*…', '… *old*…', '… *not worth much*…', and '… f*or stupid people*…'.

The data from the women were more complex. In one sense, they indicated support for the low status of farming, in comparison to alternative work, especially when interviewed in the presence of men, and in particular at the beginning of data collection. '… *Other work like army is better…than farming*…', said Abi-chomo, for example, despite their awareness of the significant and disproportionate contribution they were making towards the sustainability of the village. But this contribution could potentially challenge existing patriarchal norms. Thus, the women overtly expressed their lower status, devaluing their

work and emphasising the '… *superiority*…' of (men's) alternative work.

After a longer period in the field however, and after gaining more trust from the women, this overt maintenance of status differentiation revealed itself to be superficial on the women's part. Data showed how they saw this as instrumental for the freedom they needed to pursue '*new farming things*'. They 'played the game' to overtly collude with notions of farming being '*backward*' and '*stupid*', and overtly defined their skin care products as '*farming*', and, thus, as 'stupid', by association.

Subsequent data revealed a covert pride, quiet enthusiasm and confidence from the women. Their skincare products were emphasised as '… *having very good meaning*…', with '… *high value*…', and '*as* [being as] *good as other jobs, maybe more better*…'. As Angmo B describes:

> I think the other jobs [that the men do as paid employment] are important…the new farming things that we do…it is important as well… [they, or the money raised from their sale] will give food for the winter…and the next winter. But this is not really farming, like our husbands and sons [did], and our fathers. This is new and we [the women] must think with care…We are pleased…But it very important we [the women] do this quiet…To be important, and for the eyes to see [it] as important are different…And the difference is very important!…My husband…think we play with silly farming… farming is for stupid people…Yes…ha ha ha!!…we all laugh…But that is why we say that the new things is farming…So the new things are stupid too because [they are part of] farming…Yes…so we [the women] are allowed to go on. If said too important…then we might force to stop by the men…Quietly quietly…We don't speak about it…

The devaluation of farming was also indirectly encouraged by exposure to western lifestyles. Even though the village was not situated on overt trekking routes, the men's alternative work frequently took them to geographical areas where there were more foreign visitors, for instance. And whilst giving rise to economic opportunities, the women's trips to Leh also exposed them to western lifestyles. These were also hinted at in the packaging discarded by trekkers which would eventually drift down to the village.

Both genders expressed self-doubt and embarrassment, mainly concerning traditional ways of life, dress, food, and customs. Younger villagers were the most self-critical. Ringzen B, a woman of around twenty, for example, asked '… *Do you wear the blue jeans at your home?*…' (I was wearing shalwar kameez.) '… *I like it* [jeans] *very much…modern…Not stupid and backward like this* [indicates the traditional skirts and apron she was wearing]…'. Another younger woman asked me if I could buy her some 'Fair and Lovely' soap (containing bleaching agents) to '… *make* [her] *skin beautiful*…'. And despite a deep emotional attachment to 'their' mountains and natural surroundings, many reflected negatively on traditional living whilst exalting the perceived 'progress' of the '… *outside*…[world]', as Dolma C comments:

> …I am curious about how life is [outside the region]… I see these people…they look like space [aliens]… with [their] shoes and clothes…Do they have farms? I don't think so…I know they have machines, shops, banks…I ask [myself] what must it be like…I think they work with their heads…not their hand…I think too about how backward we are…How stupid we must look…With our simple things…As farmers…Are they laughing at us?…

This section of our findings reveal how adaptation unfurled in the community, beyond their literal responses, as we described in the previous section. We posit that our approach - again in sharp contrast to the ability of scientific approaches - generates insight into why the community responded in the way that they did, i.e. how the process of adaptation unfurled, within this specific environment, and why. This further demonstrates the value of case based research in understanding adaptation, and the implications they have for approaching the process largely with scientific principles. In a similar way to our previous section, but perhaps more markedly, reductionist tenets often used by the IPCC (2014) such as large scale 'frameworks' of adaptation (879) that can be 'scaled up' (879), as part of a 'general plan' (873) fail to adequately reflect the diverse intricacies and intangible aspects of adaptation as it unfurls in practice within communities. We discuss the implications of this in our next section in more detail, with the overall contributions that we make.

5. Discussion and conclusions

Our findings are derived from a six week stay in a small community in the Indian Himalayas. The first author indiscriminately collected data from which three aggregate theoretical dimensions emerged. Together, these show how a combination of climate change and globalisation challenged a community's survival and threatened the sustainability of traditional farming life. Like previous studies, the drivers affecting the decision to adapt were multiple and dynamic (e.g. Roco et al., 2014). Shifts in the definition and scope of farming, and in the work roles of men and women resulted in the sustainability of the community, at least in the short term. This bottom-up solution was enabled by two different phenomena: The maintenance of gender norms where men enjoyed a higher status, and the increasing derogation of agriculture that undoubtedly stemmed from pressures of globalisation.

Overall, the findings illustrate the importance of in-depth case studies to the understanding of adaptation. This forms the basis of our main contribution. There are many ways of 'knowing' adaption, and the IPCC's scientific methods that have focused on measuring aspects of climate change, and its effects within the realm of the natural world have been invaluable. However, as we argued in our introduction, the intricate workings of social life in human environments cannot be adequately captured by the same approaches. Our case study has demonstrated this by highlighting aspects of gender relations and exposure to western culture that were fundamental to how the experience of climate change unfurled for this particular community. As we reflected at the end of each subsection of our findings discussion, the connotations of scientific approaches, including those of measurement, generalisation, and objectivity, jar with the complex and sometimes intangible dynamics that we revealed in our own fieldwork. Both the overt responses to the physical impacts of climate change, and the underpinning factors that enabled such responses, were deeply embedded within every aspect of the community's 'space', i.e. its history, culture, values, physical location and size, and so on. We understood adaptation as it was experienced and manifested in the community, but only because our qualitative case study approach revealed the need to consider adaptation as inseparably entwined with its context.

Whilst we herald the value generated overall by qualitative case study research, we highlight the particular benefits of a 'living with' approach. Our approach began with the starting point of the community per se, rather than the more specific scope of climate change in the community. Like Brugger and Crimmins (2013) and Horton et al. (2015), we aimed to capture 'experience'. This enabled additional stressors that related to globalisation to emerge from within the field that were somewhat unexpected, but at the same time, crucial to how and why the community responded in the way that it did. Our approach also, again, highlights the diversity in how and why communities adapt in such different ways, even in environments that are seemingly similar. Lennox (2015), for example, describes how Peruvian farmers moved towards animal husbandry and alternative crops. This was not the case in our field. Neither did the community experience exactly the same manifestations of globalisation in the Andes that Lennox (2015) describes. Our findings also contrast on the point of gendered experience (e.g. Arora-Jonsson, 2011; Bayard et al., 2007; Dolisca et al., 2006; Fulu, 2007; Jianjun et al., 2015). The women in Dharsa had a strong presence and central role in important decision making, where they embraced radical change that challenged deeply traditional farming

norms and practices, for example.

Our illustrated value of place-based studies has real implications for the IPCC. As we have described, the organisation is responsible for generating scientific knowledge on climate change, including that of adaptation. It is a frequent reference point for policymakers. Thus, generating an accurate understanding of climate change processes and phenomena is crucial. As we have argued, and as others have also noted (e.g. Brugger and Crimmins, 2013; Orlove, 2009; Smit and Wandel, 2006; Smit et al., 1999; Smithers and Smit, 1997), the problem is grounded in the IPCC's top-down approach. Emphases on 'scaling up' projects (IPCC, 2014: 879), a 'general plan' (IPCC, 2014: 873), and 'national' interventions (IPCC, 2014: 879) are incongruent with a more prominent role for case study research - as the organisation itself acknowledges (e.g. IPCC, 2014: 25, 2014, 883).

On the one hand, the findings of case study work could provide very tentative indicators on common themes of adaptation. There is a growing conclusion, for example, that double exposure is a common occurrence, especially in developing parts of the world (Leichenko et al., 2010; O'Brien et al., 2004; O'Brien and Leichenko, 2000), especially in rural farming communities (e.g. Burton and Peoples, 2014; Keleman, 2010; Laube et al., 2012; Leichenko and O'brien, 2002; Lennox, 2015; O'Brien et al., 2004; Schilling et al., 2012; Fortier and Trang, 2013). Our own findings have a tentative relevance for understanding mountain communities, on which there is a dearth of research: It would seem that it is likely, for example, that double exposure, as we saw evidence of in our field, is a phenomenon that is relevant to at least some high altitude regions.

At the same time, human geographies are diverse. Mountainous environments, for example, are hugely varied terrains, and, as above, this reemphasises the importance of recognising the individuality of contexts, and their impact on how communities adapt. Thus, on the other hand, to embrace case study work beyond the lip service the IPCC currently pays, it must use case studies with caution, i.e. without generalising the findings of in-depth qualitative work beyond their reasonable scope.

More fundamentally, the IPCC must be willing to address its institutionalised bias towards a scientific epistemology, and its marginalisation of qualitative work (Beck, 2011; Hulme, 2017; Malone and Rayner, 2001; Pelling, 2011; Shackley and Skodvin, 1995; Yearley, 2009). By addressing these issues, it is likely that the IPCC can remain a meaningful and effect body of knowledge to which policymakers can refer.

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